Monitoring Carbon Dioxide Trends from Spectral Radiance Measurements

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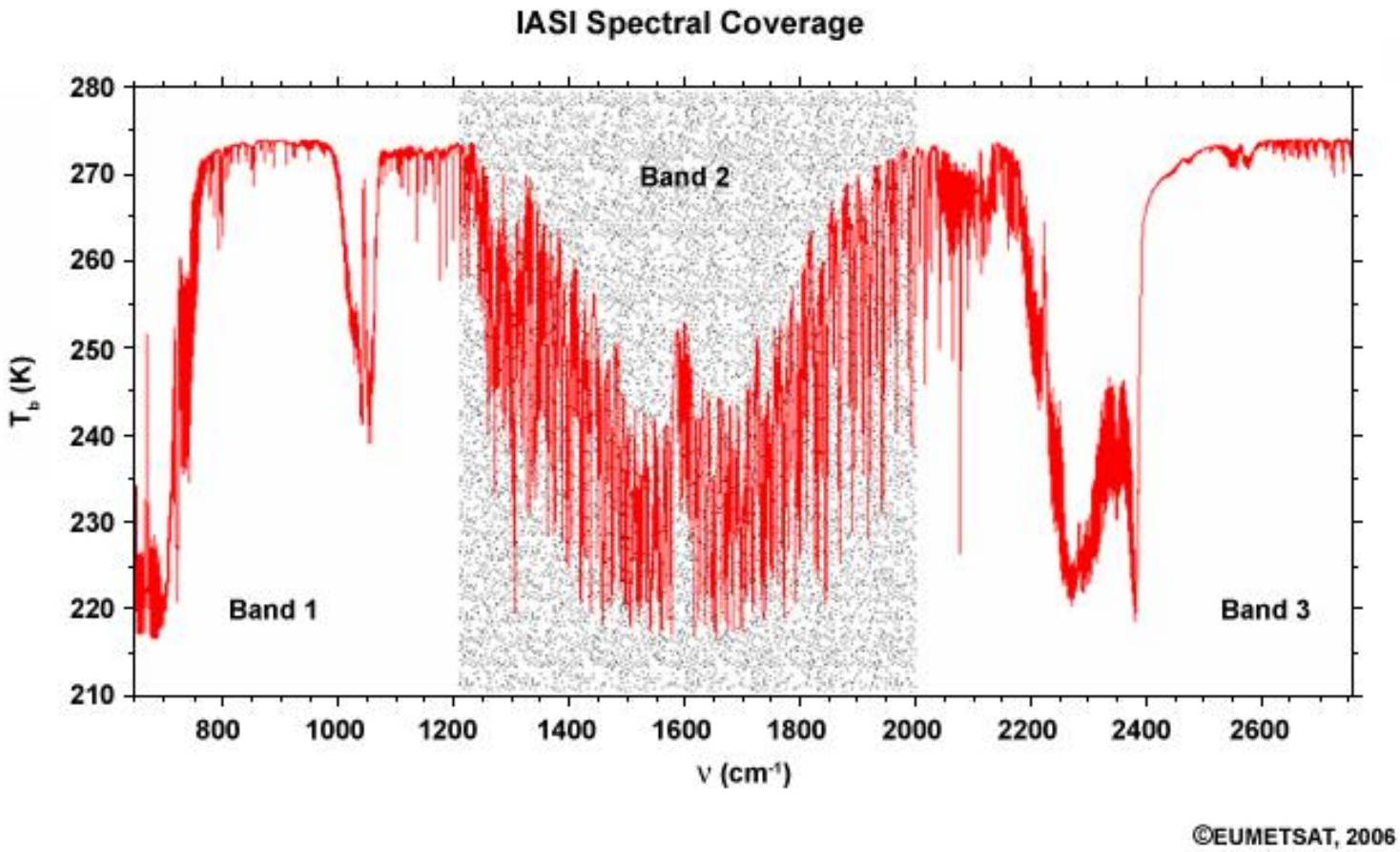
IASI Spectral Coverage
280
270
260
250
240
230
220
210
T_b (K)
Band 1
Band 2
Band 3
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
ν (cm^{-1})
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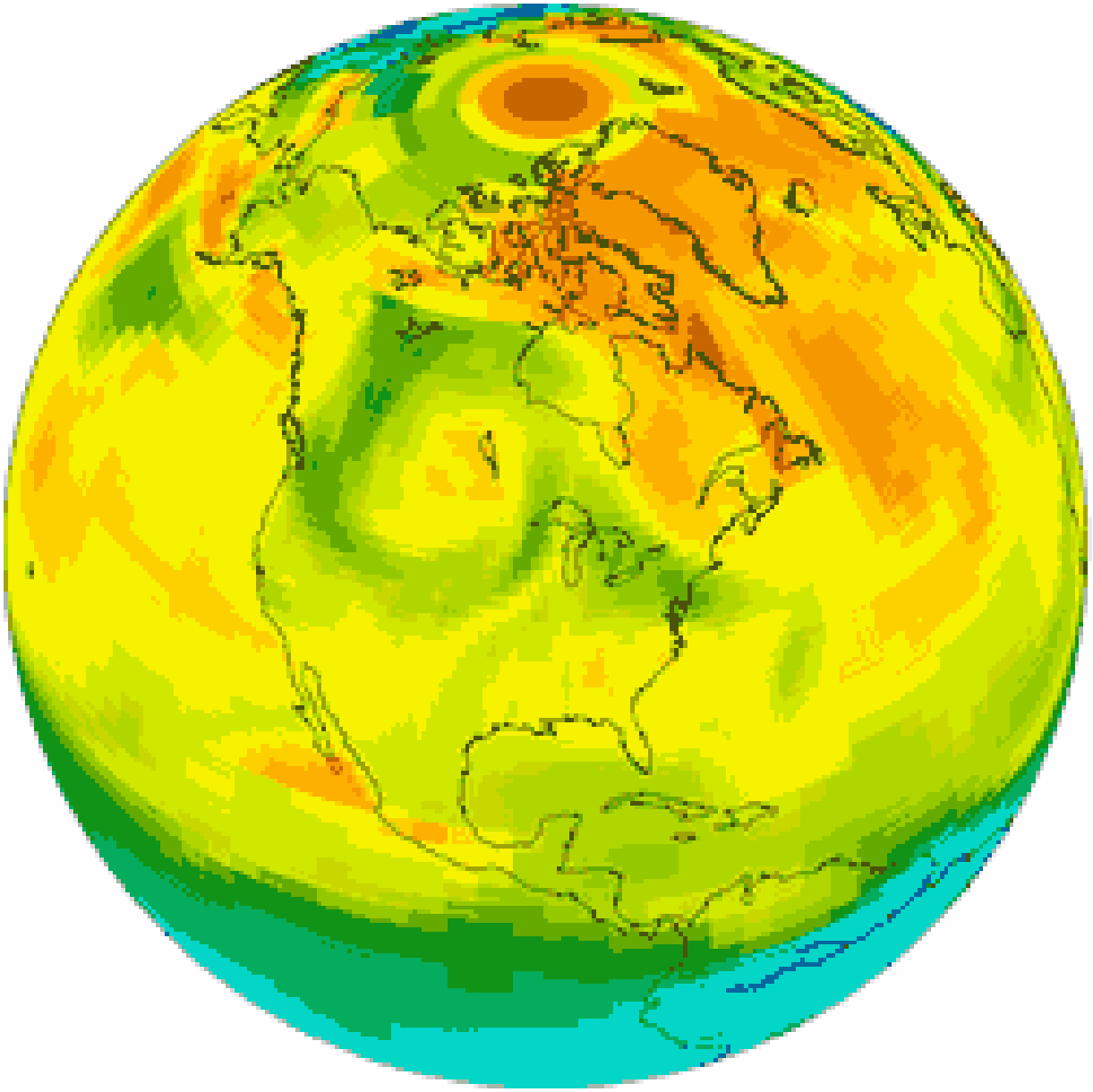
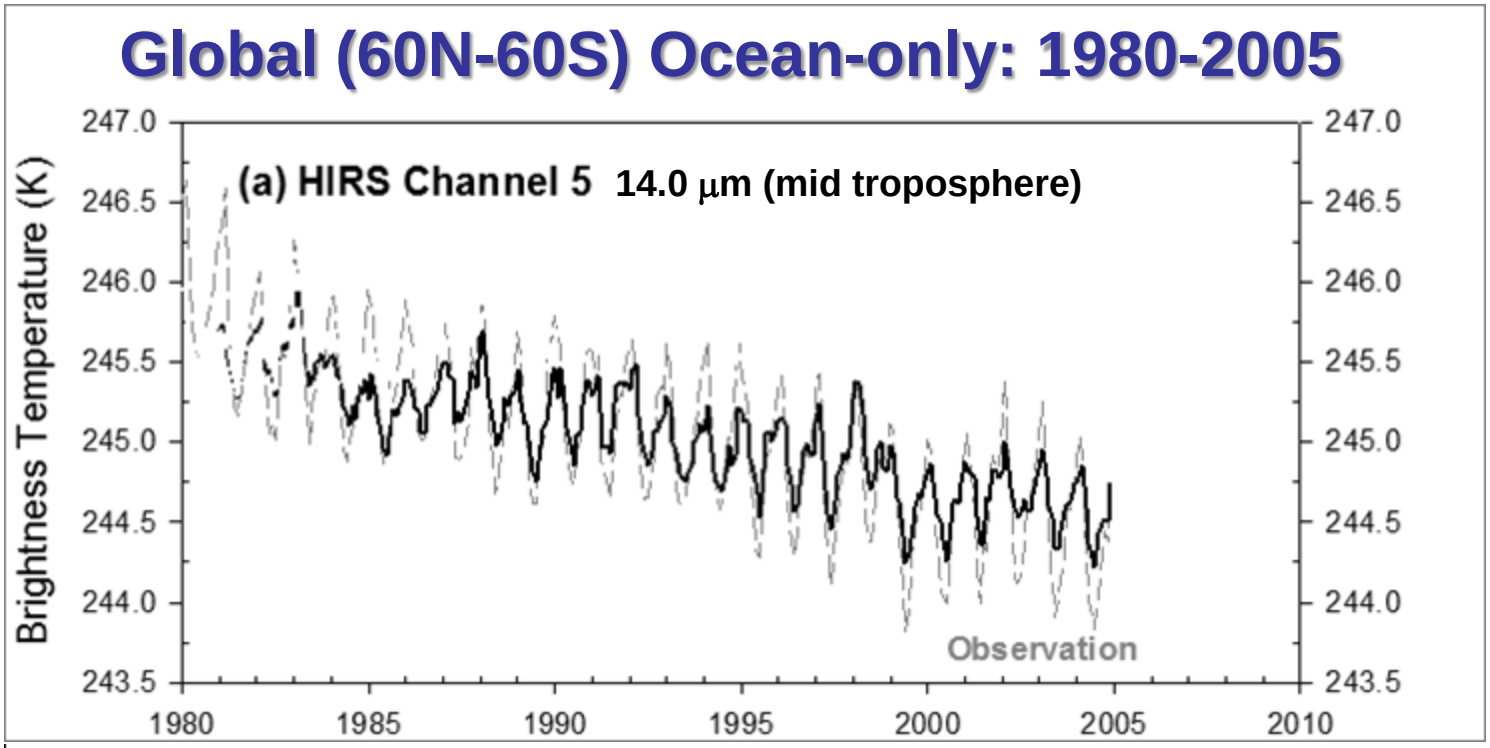
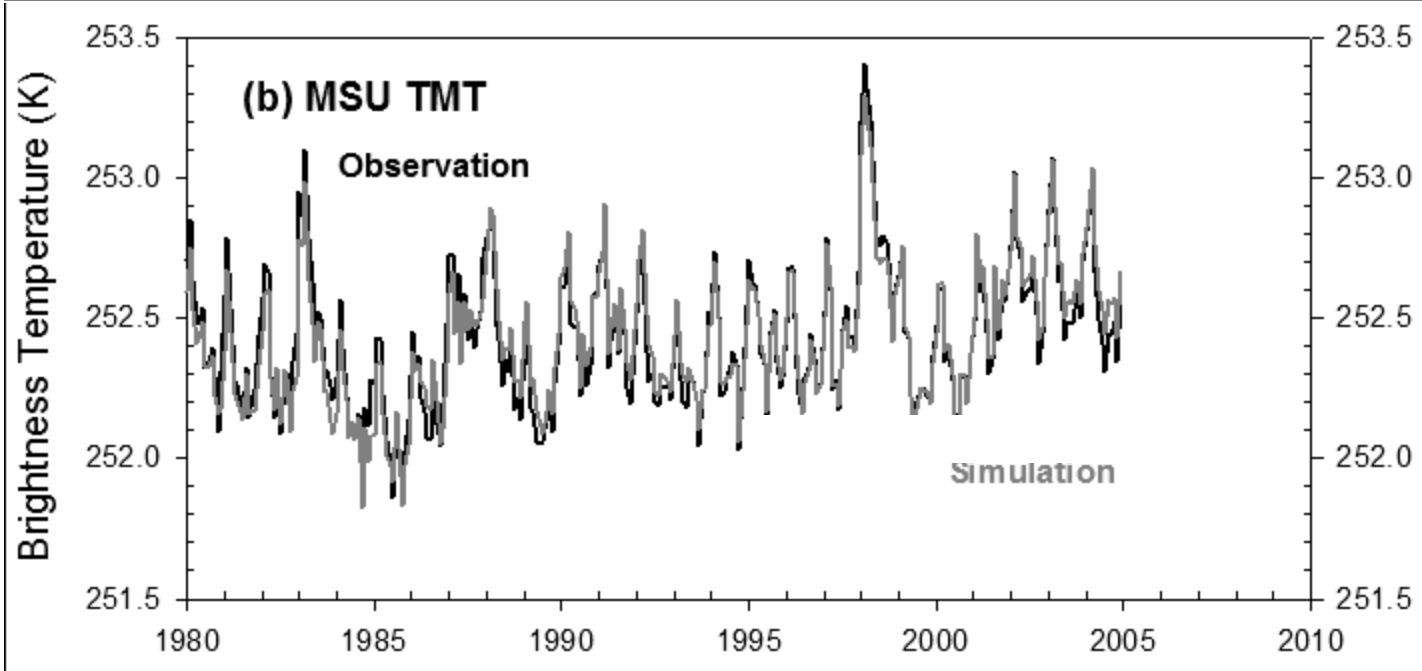
Earth-System Models are now predicting CO2!

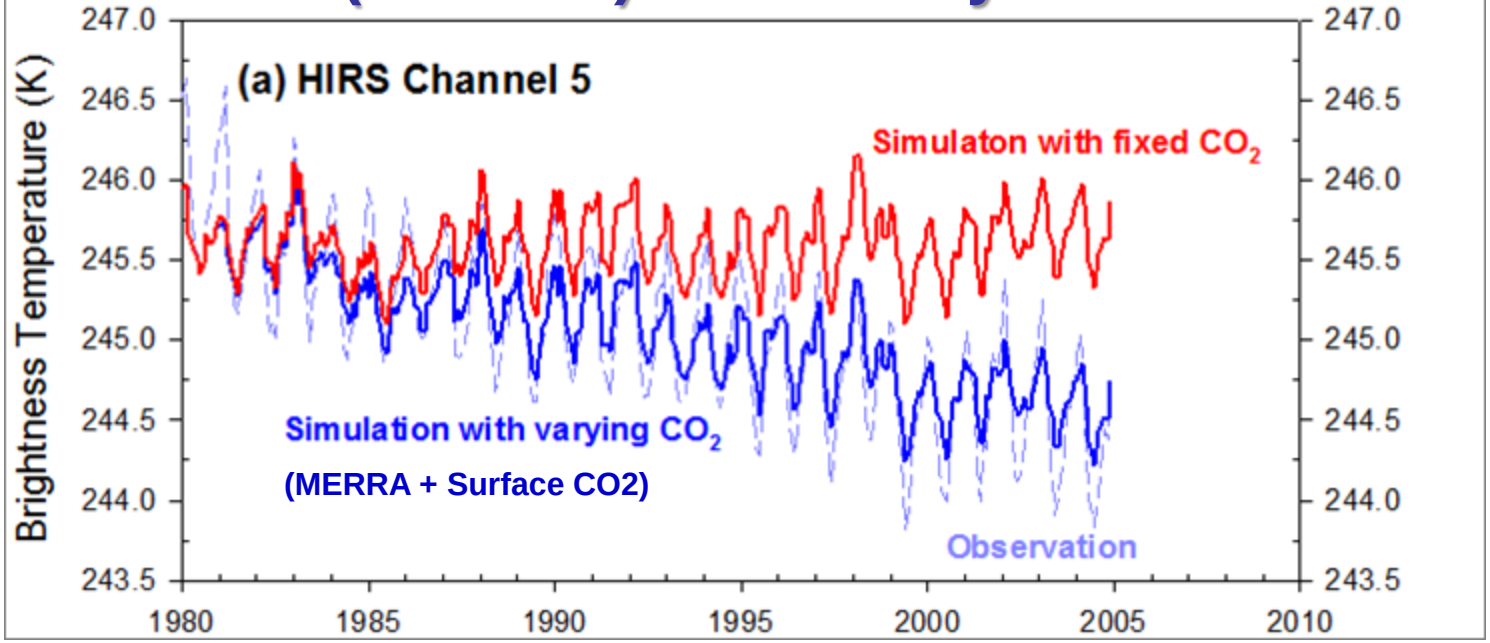


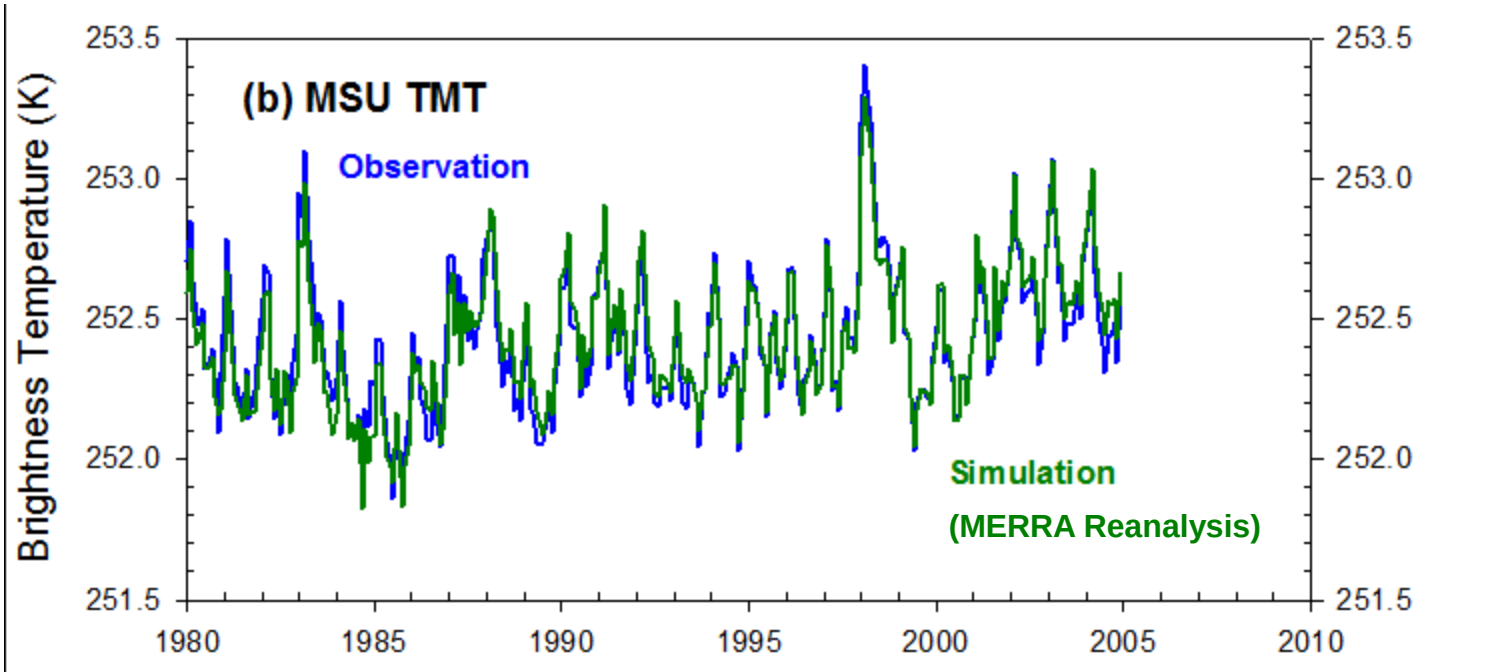
Global (60N-60S) Ocean-only: 1980-2005



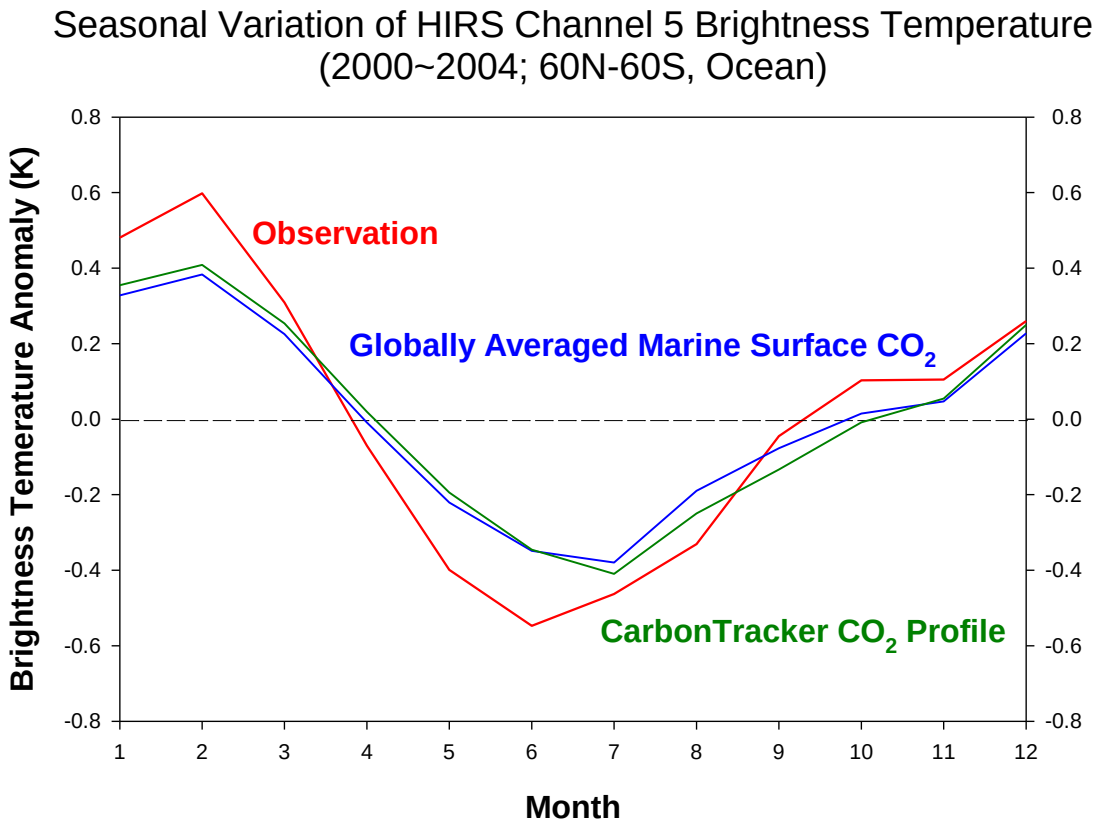


Global (60N-60S) Ocean-only: 1980-2005





Mean Seasonal Cycle: Global (60N-60S) Ocean-only

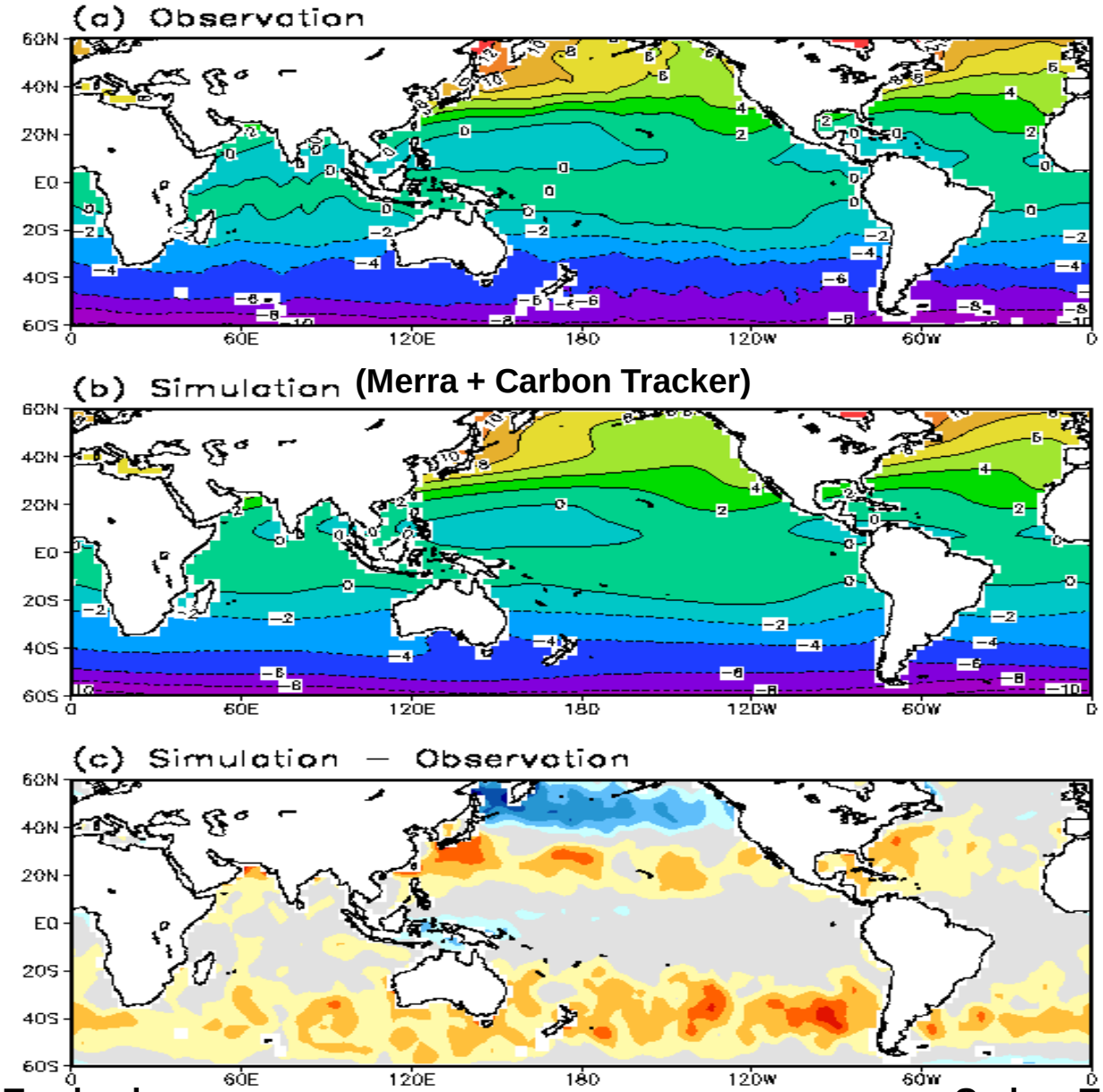


Simulation

1) Globally average marine surface CO_2: f(t)

2) CarbonTracker CO_2 profile: f(x,y,z,t)

HIRS Channel 5: JJA – DJF



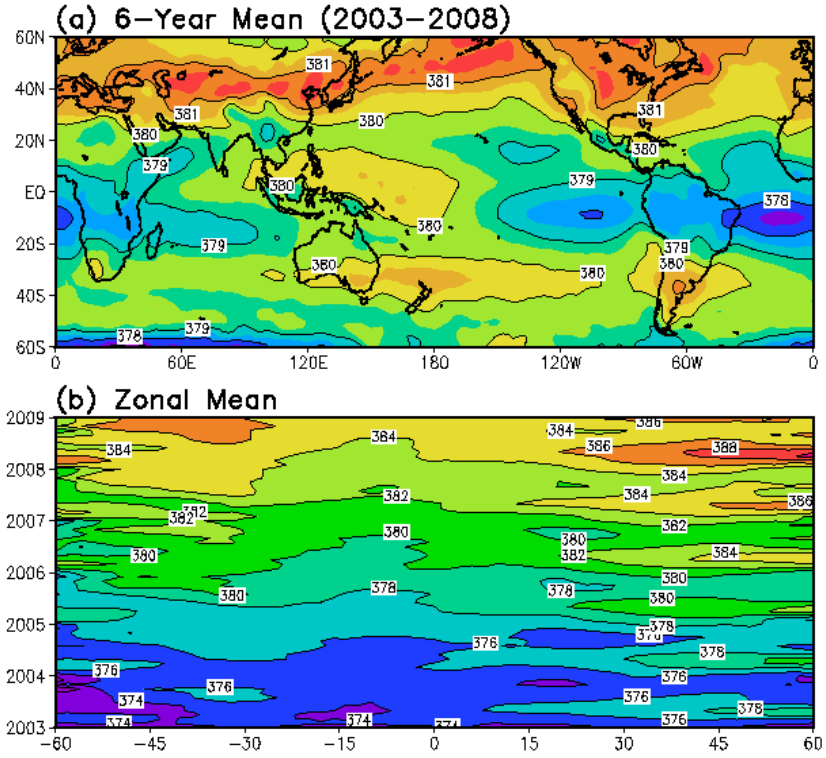
(Merra + Carbon Tracker)

Carbon Tracker has too much CO2

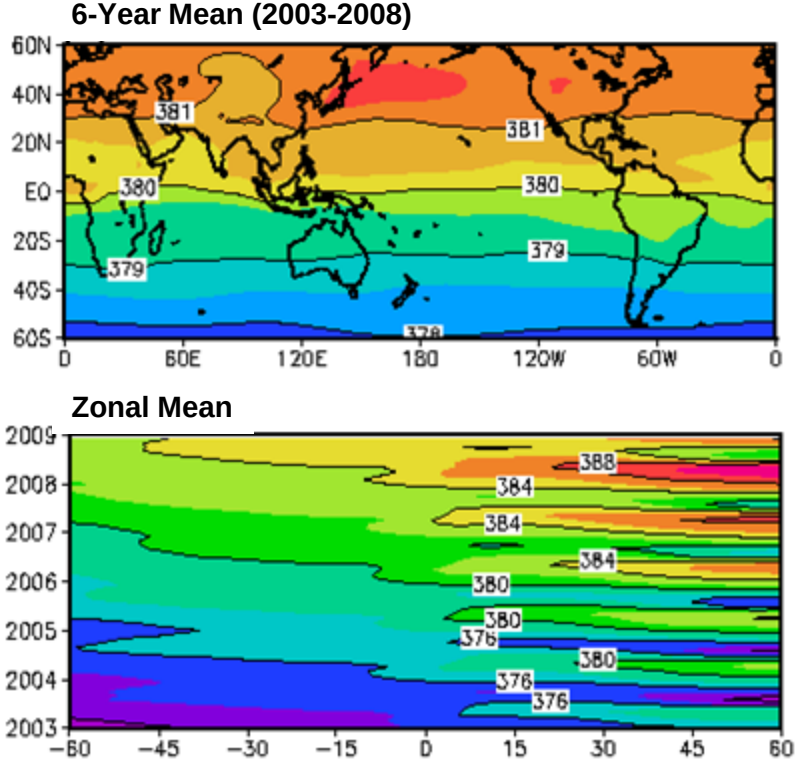
Carbon Tracker has too little CO2

Interannual Anomalies: 1980-2005

AIRS Mid-Tropospheric CO2

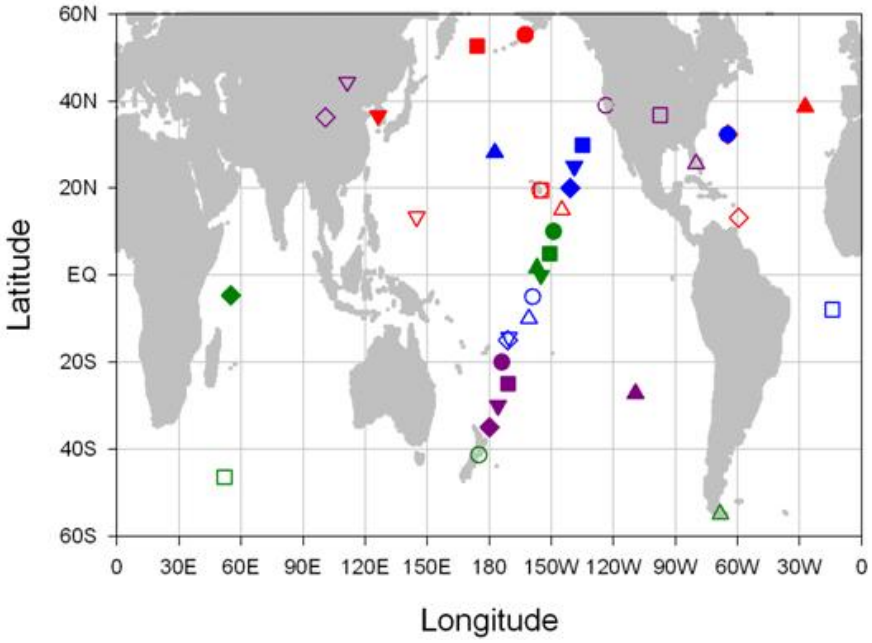


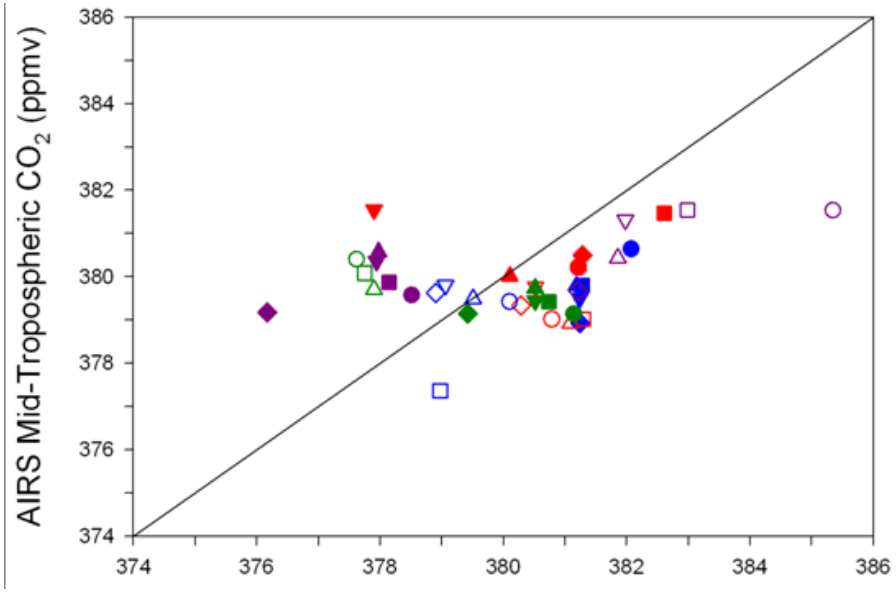
Carbon Tracker CO2 (500 mb)



AIRS exhibits much larger spatial and temporal variations in CO2

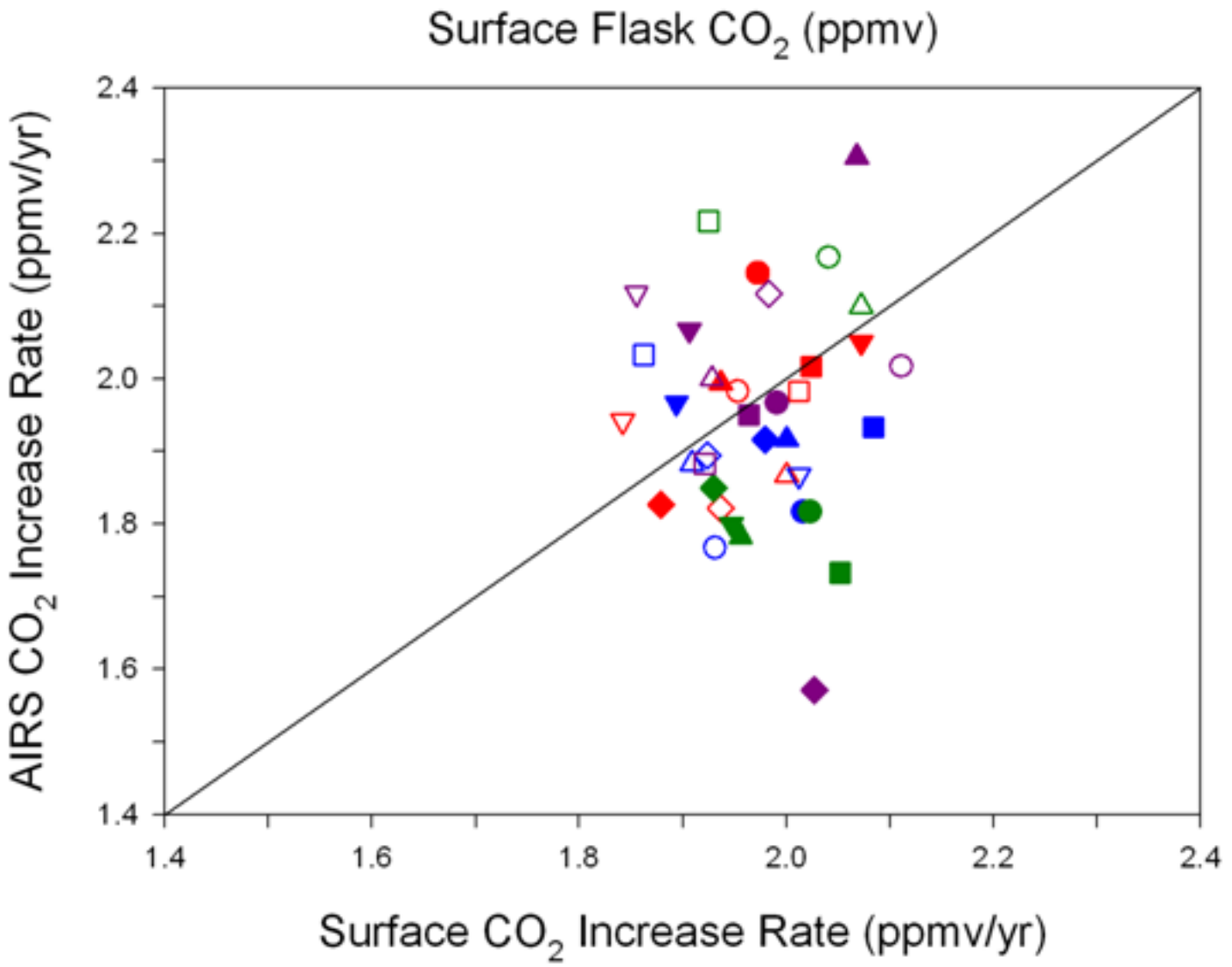
Surface Measurements vs. AIRS Mid-Trop Retrievals





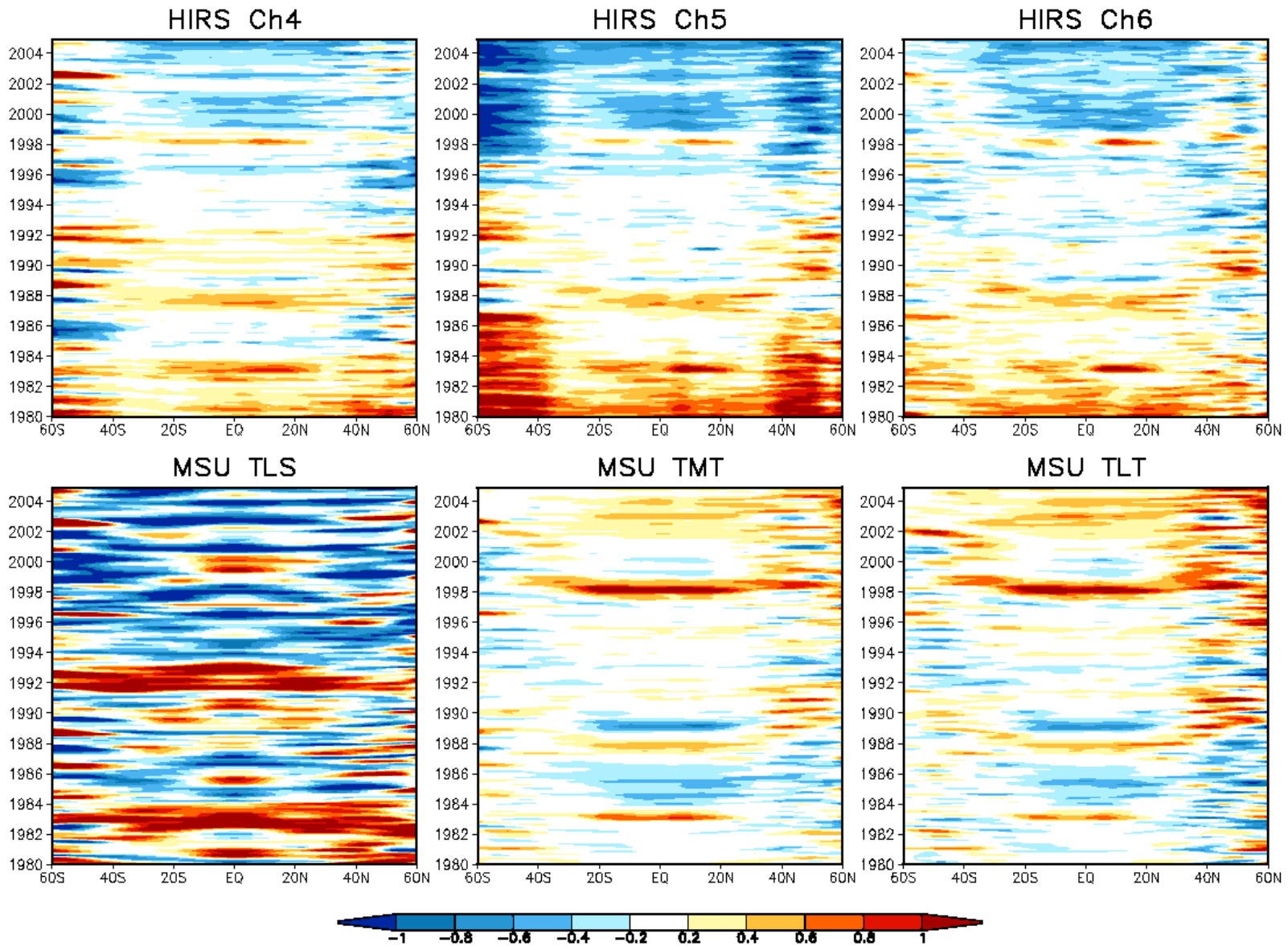
Surface flask and AIRS mid-tropospheric climatologies differ significantly

Surface Measurements vs. AIRS Mid-Trop Retrievals

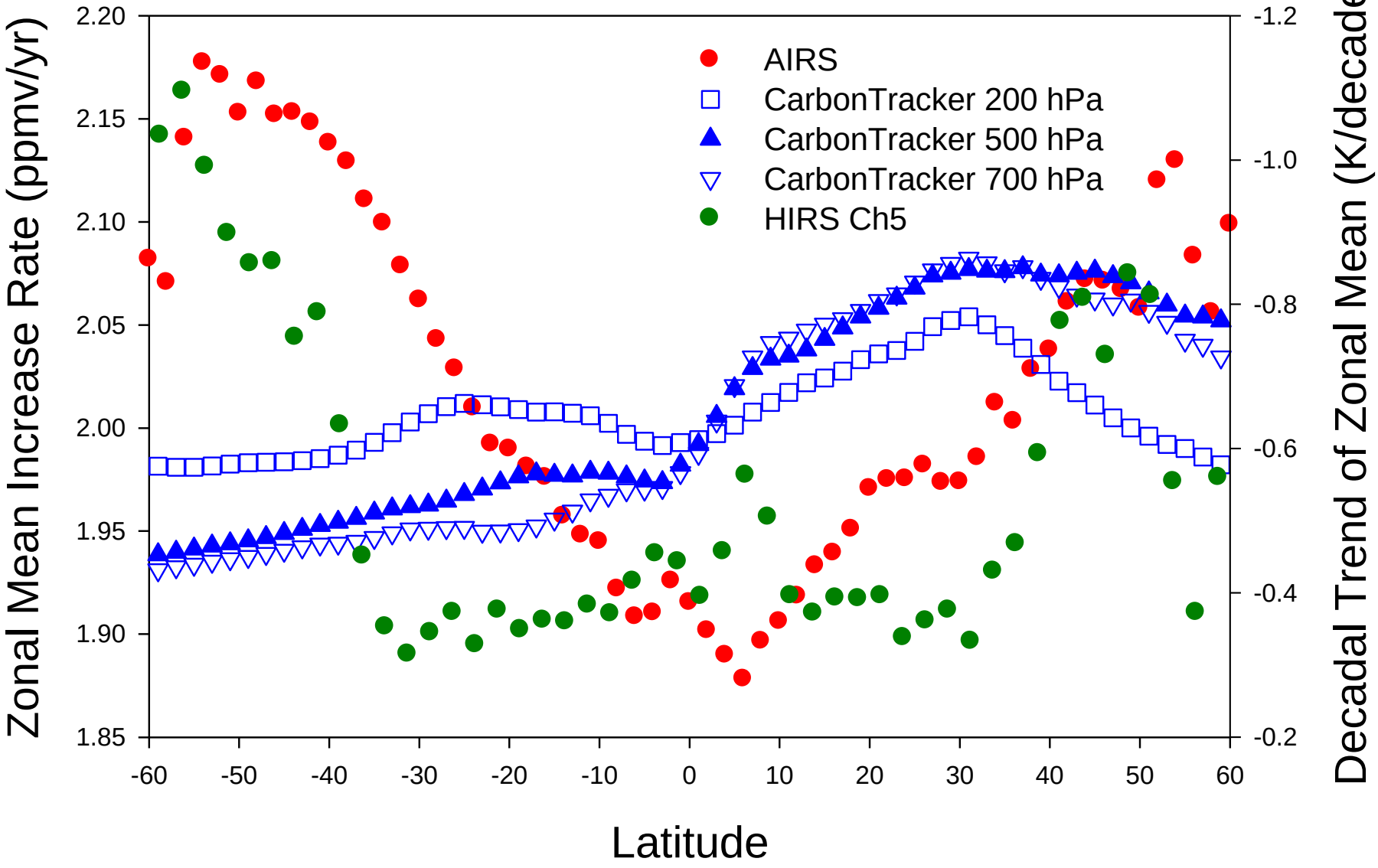


Trends have a similar range, but no correlation between surface and AIRS

Interannual Anomalies: 1980-2005



Linear Trends: 1980-2005



Conclusions

- **Satellite IR measurements suggest larger spatial and temporal variability in CO2 than produced in data assimilation products (Carbon Tracker).**

- **Trends in HIRS and AIRS suggest increases in CO2 over southern oceans which are comparable to that observed in northern hemisphere.**

- **Interested in comparing with other available CO2 retrievals/radiances.**